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Ethnobotanical and phytochemical analysis of *Martynia annua* L. in certain areas of Jharkhand

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ABSTRACT

India has been the store house of herbal medicinal plants due to varied climatic since ages. Ayurvedic, Unani and siddha many more folklore used by the indigenous people. Jharkhand state has a rich diversity of medicinal plants. The present paper deals with the ethnomedicinal plant *Martynia annua* L. which is used in certain areas of Jharkhand. Firsthand information was gathered by tribal Vaidya and knowledgeable persons regarding the medicinal plants, their uses and method of medicine preparation, doses, and duration of treatment. Jharkhand is one of the notable tribal populaces. Among its various natural endowment's vegetation is the most essential resource for mankind. The tribal and non-tribal, local people depend on indigenous and traditional medicine to cure different ailments. *M. annua* L. is a wild weed herbaceous annual plant belongs to family Martyniaceae. It is commonly known as cat's claw or Devil's claw. Jharkhand is well recognized due to presence of a great biodiversity of ethno-medicinal plants. In Jharkhand traditional practitioner are called as "Vaidya" or “kaburaja” use this plant in treatment of epilepsy, inflammation, sore throat, skin infection, burns, itching and tuberculosis and wound healing. This is due to presence of secondary metabolites such as flavonoids, terpenoids, saponins, tannins, anthocyanins, steroids, and cardiac glycosides.

Key Words - *Martynia annua* L., Vaidya, folklore, ethnomedicinal, Martyniaceae, kaburaja and Phytochemical analysis

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INTRODUCTION

For thousands of years, plants have been good source of medicine to treat illness and maintain health. According to the study reports it is found that approximately 85% of traditional medicines are used in treatment of primary health care derived from plants globally (Yadav *et al.* 2006). A diverse array of utilization of these medicinal plants has been reported by many researchers from India Kumar *et al.* (1987), Rao (1990), Kohli (1992), Kala (2005), Khumbongmayum *et al.* (2005). In the Yajurveda 82, the Atharvaveda 28 and in the Rigveda about 99 medicinal plants to cure different elements (Bodding, 1925). Documentation of different ethnomedicinal plants used by different tribes of Jharkhand were also done by different workers such as Bondya *et al.* (2002); Singh and Kumar (2003); Sahu *et al.* (2004); Kuiri *et al.* (2006); Kumar and Kumar (2009) and similar work were also carried out in Purulia district of West Bengal Kuiri and Kumar.

Traditional knowledge of Jharkhand Tribes passes their knowledge from one generation to the next orally. In present modern world, still depend on medicinal plants for their primary health care needs.

Usually fruits, flowers, leaves, stem, barks, and seeds of plants are rich in secondary metabolites that produce definite pharmacological effects on human body. *Martynia annua* L. is an upright short-lived herbaceous plant. The young fruits are oblong and green with long beack (claw), but when dry, becomes woody with two sharp hairy curved hooks. *M. annua* L., belonging to the family Martyniaceae, is a herbaceous annual plant known for its distinctive claw- like fruits. This species is widely recognized under various vernacular names: "Bichhu" or "Bichhoo Ghaas" in Hindi, "Kakanasika" in Sanskrit, "Devil's claw" or "Cat's claw" in English, and "Kaakanassikaa" in Ayurveda.

Scientific classification:

Kingdom	:	Plantae
Subkingdom	:	Tracheobionta
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Order	:	Lamiales
Family	:	Martyniaceae
Genus	:	*Martynia*
Species	:	*M. annua* L.

M. annua L. is an erect, branched, glandular-hairy annual herb, typically reaching a height of 0.5-1.5 meters. The stems are thick, pubescent, and somewhat sticky due to glandular hairs. Leaves are large, broadly ovate to cordate, simple, alternate, and covered with sticky glandular trichomes, which may deter herbivores. The leaf margins are entire, and venation is prominently reticulate. The flowers are pale pink to purple, trumpet-shaped, and arranged in terminal or axillary cymes. The corolla is tubular- campanulate, with a broad limb and yellowish throat often marked with darker spots that attract pollinators. The fruit is a characteristic woody capsule with two recurved, horn-like projections ("claws"), which help in seed dispersal by attaching to animal fur. Seeds are oblong, flattened, and embedded within the woody capsule. Mostly flowers, fruits, leaves, stem, barks and seeds of plants are rich in secondary metabolites that produce definite pharmacological effects on human body. *M. annua* L. is an upright short-lived herbaceous plant. The young fruits are oblong and green with long beack (claw), but when dry, becomes woody with two sharp hairy curved hooks (Manandhar & Manandhar, 2002). It is native to Mexico, Central America, mostly naturalized in northern Australia and South Eastern Asia. It is commonly known as cat's claw, devil's claw and bichu. The fruits and leaves are biologically active parts of this plant (Chopra & Nayer, (1996). It is used for the treatment of epilepsy, inflammation and tuberculosis (Kenwat, 2013). The leaves of the *M. annua* L. are edible and used as antiepileptic, antiseptic and applied locally to tuberculosis glands of the neck (Babu & Mohana, 2010). The juice of the leaves is used as a gargle for sore throat and the leaf paste for wounds of domestic animals (Singhai, 2011). The unripe fruits of *M. annua* L. found to have antioxidant activity and the ash of fruits mixed with coconut oil are used to cure burns. The fruits are also used as local sedative and antidote to scorpion stings (Ashwani *et al.*, 2013). Seed oil is used for abscesses and treating itching and skin infections. The seeds of *M. annua* L. are used for prevention of graying of hair (Khare, 2007).

The whole plant is used for fever, hair loss, scabies, and abscess on the back (Kirtikar, 1994). An antioxidant is a substance that prevents or delays oxidation of other molecules. Free radicals are produced during oxidation which can be trapped by antioxidants. In plants, natural exogenic antioxidant substances are present *i.e.* vitamins phenolic acids, flavonoids, phenolic diterpenes, oils and plant pigments like anthocyanins scavenge free radicals such as peroxide, hydroperoxide or lipid peroxidation. Free radical and reactive oxygen species (ROS) are basically the main causes of several disorders in humans like cancer, heart disease, ageing, diabetes, Alzheimer's, Parkinson's diseases (Young, 2011), by inhibiting a reaction cycle. Different methods are used to assess the antioxidant and free radical scavenging activity. *In vitro* antioxidant activity is mostly measured by DPPH method developed by Biols, hydrogen peroxide scavenging assay (Ruch, *et al.*), nitric acid scavenging activity (David & Bredt, 1993), ferric reducing antioxidant power assay (Virginia, *et al.*

2003) and reducing power method (Benzie & Strain 2005).

MATERIALS & METHODS

The ethnobotanical survey and studies were conducted in certain areas of Jharkhand during the onset monsoon till the New year viz. Lapung block in Ranchi District, kisko block in Lohardaga, Patratu block in Ramghar district, Bharno block in Gumla district, Jori in Lohardaga district, Karamtoli in Ranchi district, Pesrar block in Lohardaga, Bangru in Ranchi District, Turup in Ranchi District, Tatatola in Ranchi district, Masia in Gumla Gumla district, Kharyia Para in Gumla district, Etta in Lohardaga district, Tuku Deghyia in Ranchi district, Chanho in Ranchi, Gegeda in Ramgarh, Kandra in Lohardaga, Gagarin in Ranchi, Balkudra in Ramgarh. District, Mahuwatoli in Lohardaga district, Chitri Mahuwatoli in Lohardaga, Bharno in Gumla district, Booti Kandra in Lohardaga district, Naya Khap in Hazaribagh district, Taiara in Ranchi Tata Road, Katingkella in Ranchi district, Balumath in Latehar district, Anwla, Majhgaon in wear Singhbhum, Torpa in Khuti district, Charhi in Hazaribagh, Kedla, Ghato in Bokaro district.

The plant materials were collected in wild conditions during post monsoon to beginning of new year. The plant materials viz. fresh rhizomes, fresh roots, fresh stems, fresh leaves, fresh flowers, fresh fruits (Capsules) and dried ripped seeds collected from the healthy plant *M. annua* L. (Martyniaceae). The study was done in 38 different areas of Jharkhand state. Ethnomedicinal data were collected by following the standard method, (Jain (1987), Jain & Mudgal (1999), from 38 different tribal locations with the help of available local people and traditional healers. The information were collected from the traditional practitioner with all gender groups. The information were collected through questionnaire, by lateral discussion and open-ended interviews - were recorded. The language for the interview was Sadri, Nagpuri, and Hindi. Plant was documented and identified with the help of different record, books, and plant taxonomy like flora as Botany of Bihar and Odisha. Photographs of traditional medicine practitioners (men and women), local people, on-site practitioners as well as living plants were taken. Herbarium was prepared adopting standard practice and preserved in the university Department of Botany, Ranchi University, Ranchi for reference.

Information's about *M. annua* L. were collected from the tribal, non-tribal, local people through questionnaire and interview. The knowledge of herbal medicine in day today life was consulted documented through personal interview. Detailed information regarding the plant parts used in medicine with doses and proper references were collected reviewed and documented systematically. Material used were- Camera, Scalpel, Pen, Notebook, Plastics bag, Knife, Scissors, Tape etc.

Qualitative phytochemical analysis of fresh Rhizome, fresh Roots, fresh Stem, fresh leaf, Fresh Fruit (Capsule) and ripped dried seed of *M. annua* L., all collected separately. Then each material crushed and grinded separately with the help of Natural stone Mortar and Pestle. The grinded materials of each plant parts were then dipped and dissolved in Acetone solvent. This process is done for the identification of saponins, anthocyanins, protein, flavonoids, carbohydrate, phlobotamin, Glycosides, Phenol, Tanin, Terpenoids, steroids, Alkaloid were done by prescribed methods. Harborne (1973), Trease & Evans (1989), Sofowora (1993).

RESULTS

The ethnobotanical survey and studies were conducted in certain areas of Jharkhand.

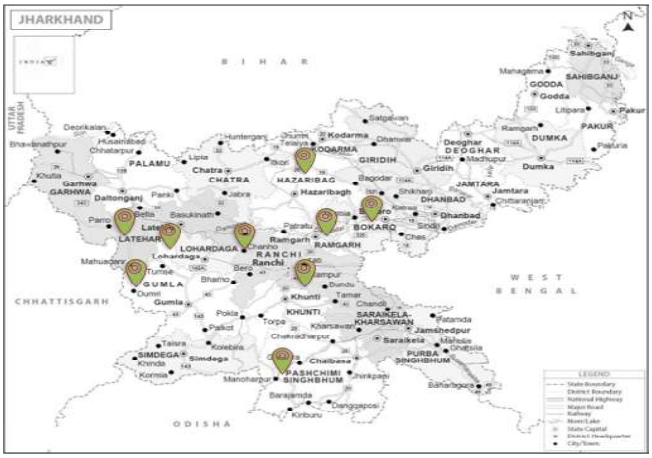

Figure 1: District covered- Ranchi, Lohardaga, Khunti, West Singhbhum, Gumla, Latehar, Ramgarh, Hazaribagh, Bokaro.

Table 1: Survey report areas of certain Blocks of Jharkhand with Vaidya's, and Knowledgeable Person

S. No.	Name	Age / Sex	Place	Knowledge acquired/ Findings	Photo with Vaidya's
1	Ramesh Sahu	45/ M	Kisko, Lohardaga	*Martynia annua L.*, seed boiled, with mustard oil and massage over skin to cure skin itching, Paste of *Martynia annua L.*	
2	Raghunath Oraon	46/ M	Jori, Nawa toli, Lohardaga	Capsule or leaves to apply on Scorpion's sting and insect's biting *Martynia annua L.,* Root powder	
3	Sukra Khalkho	60/ M	Karamtoli, Ranchi	with milk as tonic – used as energy drink Martynia annua L. Seeds boiled	
4	Hakim baba	38/ M	Pesrar, Lohardaga	with mustard oil and jaifal to cure body pain	
5	Somra Oraon	45/ M	Kandra, Lohardaga	*Martynia annua* L. roots or seeds boiled with karanj seed's oil to cure skin diseases	
6	Fagu Oraon	57/ M	Churku, Khakhri Toli, Lohardaga	*Martynia annua* L. leaves or fruits paste to apply for scorpion's sting	
7	Bhudhan Oraon	70/ M	Kedla, Bokaro	*Martynia annua* L. seed boiled with mustard oil to cure body pain and skin itching	
8	Sukhmaniya Tana Bhagat	55/ M	Sesai, Gumla	Paste of *Martynia annua* L. leaf for curing insects biting	
9	Johaans Kachap	36/ M	Arma Lathdag, Lapung	*Martynia annua* L. seed for spiritual practicing - removing bad spirits and leaf used for cleaning utensils	
10	Paras Nath Bhagat	67/ M	Bangru, Lapung	*Martynia annua* L. Seeds boiled with mustard oil or karanj oil to cure body pain	
11	Balku Mahto	53/ M	Turup, Angara, Ranchi	*Martynia annua* L. roots/leaf/fruit mixed with tal mishri solution to cure babasir	
12	Kajru Mahto	58/ M	Baijnath, Tatatola, Angara, Ranchi	*Martynia annua* L. seed boiled with mustard oil to cure paraswati fever in women	
13	Baji Bhagat	50/ F	Panda Masia, Bharno, Gumla	*Martynia annua* L. leaf/ fruit paste in wound healing	
14	Bindas Mahli	55/ M	Kharyia Para, Gumla	*Martynia annua* L. seed mixed with jaifal and singric solution to treat falaria	

15	Somro Bhagatiyan	50/ F	Itta, Lohardaga	*Martynia annua* L. root or seeds or leafs boiled with mustard oil to cure wound in head and body pain	
16	Dharma Oraon	47/ M	Kandra, Senha, Lohardaga	Burned *Martynia annua* L. seeds mixed karanj oil to remove head wound	
17	Ram Sahay Khashyap	41/ M	Toko Deghyia, Ranchi	Root powder of *Martynia annua* L. mixed with milk to use as energy tonic drink	
18	Durga Oraon & Anita Oraon	72/ M	Chano, Chutiyo, Ranchi	*Martynia annua* L. root or leaf paste solution to cure inflammation	
19	Rajan Gari	41/ M	Gageda, Patratu, Ramgarh	*Martynia annua* L. fresh flower or powder form enhance immunity power	
20	Baiju Lohra	38/ M	Kandra, Lohardaga	*Martynia annua* L. fresh leaf or powder form to cure wound or infection	
21	Poonam Devi	46/ F	Gagari, Ormanjhi, Ranchi	*Martynia annua* L. seed boiled with mustard oil for treating ear pain	
22	Jalkhu Phahan	74/ M	Balkudra, Patratu, Ramgarh	*Martynia annua* L. seed burned with karanj oil and jaifal for treating skin infection during rainy season	
23	Sulochani Devi	63/ F	Etta, Lohardaga	*Martynia annua* L. root powder mixed with chirchri root paste to treat dental diseases	
24	Dinesh Oraon	47/ M	Mahuwatoli, Lohardaga	*Martynia annua* L. leaf gargling for sour throat treatment	
25	Dhanyia Devi	72/ F	Chitri Mahuwatoli, Lohardaga	*Martynia annua* L. fruit ash mixed with coconut oil in treatment of burns	
26	Taufiq Rajak	33/ M	Bharno, Gumla	*Martynia annua* L. roots, leaves and seed mixed with other medicinal plants used to treat tuberculosis and epilepsy	
27	Mannu Bhagat	53/ M	Booti, Kandra, Gumla	*Martynia annua* L. leaf juice for scorpion sting and Martynia annua L. root powder with milk for immunity booster	
28	Jeevan Kherwar	47 / M	Lapunj, Ranchi	*Martynia annua* L. leaves used in treating epilepsy	
29	Kheru Mahto	68 / M	Naya Khap, Hazaribag Road	*Martynia annua* L. leaf, fruit and root used in different ways to treat snake bite	

30	Surender Panna	51 / M	Etta, Lohardaga	*Martynia annua* L. burned seed mixed with coconut for treating itching and eczema	
31	Fulchand Malhar	54 / M	Taiara, Ranchi Tata Road	*Martynia annua* L. root and leaves in trading wound healing	
32	Sunil Kherwar	28/ M	Katingkella, Lapunj, Ranchi	*Martynia annua* L. all parts used in treating various ailment and chronic disease	
33	Anil Munda	32/ M	Katingkella, Lapunj, Ranchi	*Martynia annua* L. leaves mixed with other medicinal plants to treat epilepsy	
34	Chamru Oraon	54/ M	Balumath, Latehar	*Martynia annua* L. root and seed boiled with mustard oil for pain relief.	
35	Bhimsen Tudu	48/ M	Anwla, Majhgaon, West Singhbhum	*Martynia annua* L. root and other parts in combination with other medicinal herbs to treat snake bite	
36	Arjun Chauhan	33/ M	Pesrar Bazaar, Lohardaga	*Martynia annua* L. seeds mixed with many other herbal medicines and ingredient to make oil for treating various body pain	
37	Shiv Sankar Bhagat	58/ M	Murhu Bazaar, Khunti	*Martynia annua* L. root and leaf paste for treating dental pain	
38	Aghnu Munda	44/ M	Torpa Bazaar, Khunti	*Martynia annua* L. leaves and flowers used in treating diabetes	

Table 2: A summary of data on the utilization of different plant parts of *Martynia annua L.* in traditional medicine, presented as approximate percentages (based on field surveys, literature references, and Vaidya findings).

Plant Part	Approximate Utilization (%)	Main Uses
Leaves	30%	Wound healing, insect bites, anti-inflammatory, antiseptic applications, gargling for sore throat.
Seeds	25%	Skin diseases, body pain, ear pain, spiritual practices, immunity boosting, fever.
Roots	20%	Energy tonic, epilepsy, tuberculosis, dental issues, pain relief.
Seeds	25%	Skin diseases, body pain, ear pain, spiritual practices, immunity boosting, fever.
Roots	20%	Energy tonic, epilepsy, tuberculosis, dental issues, pain relief.
Fruits	10%	Burns (ash), inflammation, wound healing, infections.
Flowers	5%	Immunity enhancement, diabetes treatment, mixed formulations.
Whole plant / Combination	10%	Composite decoctions for chronic ailments, multi-herb formulations for snake bites, filaria, general tonic.

Table 3: Phytochemical Analysis of Rhizomes, Roots, Stems, Leaves, Flowers, Fresh Fruits (Capsule), Dried Seeds

S. No.	Phytochemicals	Rhizome	Roots	Stems	Leaves	Flowers	Fresh Fruits	Dried Seeds
1	Saponins	-	-	-	-	+	-	-
2	Anthocyanides	+	+	+	+	+	-	-
3	Proteins	+	+	+	+	+	+	+
4	Flavonoids	+	+	+	+	+	+	+
5	Carbohydrates	+	+	+	+	+	+	+
6	Phlobotamines	+	+	+	+	+	-	+
7	Glycosides	+	+	+	+	+	+	+
8	Phenols	+	+	+	+	+	+	-
9	Tannins	+	+	+	+	+	+	-
10	Terpenoids	+	+	+	-	+	+	-
11	Steroids	+	+	+	+	+	-	-
12	Alkaloids	+	+	+	+	+	+	+

Saponins were found only in the flowers and were absent in all other plant parts. The presence of saponins exclusively in flowers suggests that they may play a specific role in plant defense or reproduction, potentially acting as natural antifungal or antibacterial agents that protect the reproductive structures. Anthocyanins were detected in all vegetative parts (rhizomes, roots, stems, and leaves) and in the flowers, but absent in fresh fruits and dried seeds. Anthocyanins are well-known for their antioxidant properties and their role in protecting plant tissues from UV radiation. Their abundance in vegetative parts and flowers supports their involvement in stress protection and attraction of pollinators. Proteins were consistently present across all parts of the plant, including rhizomes, roots, stems, leaves, flowers, fresh fruits, and dried seeds. This suggests a uniform distribution of proteinaceous compounds necessary for various metabolic and structural functions throughout the plant. Flavonoids were also universally present in all plant parts analyzed. Flavonoids are known for their diverse biological activities, including antioxidant, anti-inflammatory, and antimicrobial effects. Their widespread presence indicates a significant role in the overall defense mechanism and physiological functions of the plant. Carbohydrates were detected in all samples, reflecting their fundamental role as primary metabolites providing energy and structural support in plant cells. Phlobatannins were present in most parts, except for fresh fruits. Interestingly, phlobatannins were detected even in dried seeds, indicating their potential role in seed protection and viability. Glycosides were consistently found in all plant parts. Glycosides are known for their therapeutic activities and contribute to the medicinal properties of many plants. Phenols and tannins were present in all vegetative and reproductive structures except dried seeds. Their absence in seeds might be due to developmental or ecological reasons, as seeds often require different protective mechanisms. Terpenoids were found in all parts except leaves and dried seeds. Terpenoids have been documented for their roles in plant growth regulation and defense against herbivores and pathogens. Steroids were detected in all parts except fresh fruits and dried seeds. This selective distribution suggests specific biosynthetic or storage roles in vegetative and certain reproductive tissues. Finally, alkaloids were present in all analyzed parts, indicating a widespread distribution. Alkaloids are well known for their strong biological activities and play essential roles in plant defense against herbivores and pathogens. Overall, the widespread presence of important phytochemicals such as flavonoids, alkaloids, proteins, and carbohydrates indicates the high medicinal potential of this plant. The selective presence or absence of other compounds such as saponins and terpenoids in specific parts may provide important clues for targeted therapeutic applications.

DISCUSSION

The present investigation on *Martynia annua L.* (Martyniaceae) offers valuable insights into its ethnomedicinal importance, especially among rural and tribal communities of Jharkhand. The documented field uses, such as applying leaf paste on wounds, using seed oil for skin disorders and body pain, and consuming root preparations as tonics, resonate strongly with earlier reports. Previous scholars have extensively explored traditional and pharmacological aspects of medicinal plants among various tribal groups. Early ethnobotanical work by Bodding (1927), Ghosh *et al.* (1980), and Gupta (1981) laid foundational knowledge of plant-based therapies among tribal societies in Chotanagpur and Santal regions. Hembrom (1991,1995) and Verma (1990) further documented indigenous herbal practices, emphasizing their cultural relevance and therapeutic significance. Similar observations on local tribal medicine systems were made by Sahoo & Mudgal (1993), Pal & Jain (1998), and Topno (1996). Notably, Kuiri *et al.* (2002) demonstrated the plant's application for rheumatism, and similar uses for pain relief and inflammatory conditions were noted across different tribal regions. The multifaceted therapeutic practices-such as using *M. annua L.* for scorpion stings, dental pain, and as an immunity booster-reflect the plant's

versatility, as seen in field surveys and earlier community-based studies.

The current study thus not only corroborates these extensive previous works but also provides new ethnomedicinal evidence, documenting specific preparation methods and local modifications. These integrated findings confirm the pharmacological promise of *Martynia annua L.* and justify the need for further in-depth clinical validations and standardization efforts. Future work should focus on isolating active constituents, elucidating mechanisms of action, and ensuring dosage safety to fully leverage its therapeutic potential.

CONCLUSION

The present work on *Martynia annua L.* brings to light its rich traditional uses and detailed phytochemical composition, particularly as practiced and known among the tribal and rural communities of Jharkhand. Through extensive field surveys and direct interactions with traditional healers and residents, it became clear that *Martynia annua L.* occupies a special place in folk medicine, being relied upon for the treatment of various health issues such as epilepsy, skin ailments, wounds, and respiratory problems.

The qualitative phytochemical investigations carried out on different parts of the plant- including rhizomes, roots, stems, leaves, flowers, fruits, and seeds-revealed a wide spectrum of bioactive compounds. The consistent presence of important groups such as flavonoids, alkaloids, proteins, carbohydrates, and glycosides across most parts suggests their significant role in the medicinal value attributed to this plant. The selective presence of certain compounds, for example, saponins only in the flowers, highlights the diverse biochemical strategies of the plant for its survival and defense.

These findings not only reinforce the traditional beliefs regarding the plant's healing potential but also provide a scientific basis for its continued use and possible future applications. By documenting these observations, the study serves as a bridge between traditional knowledge and modern scientific understanding. Moreover, this work emphasizes the need to further explore *M. annua L.* through detailed pharmacological and clinical studies, to unlock its full therapeutic promise in a safe and standardized manner.

In essence, the study reaffirms the importance of preserving indigenous knowledge systems and encourages a deeper scientific inquiry into plants that have long been a part of our cultural and medicinal heritage. It is hoped that these efforts will inspire future researchers to delve deeper and contribute to the development of evidence-based herbal medicines derived from *M. annua L.*

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REFERENCES

Ashwani D., Bhawan, C., Sanjeet K. M. 2013. *Martynia annua*: A Review on its Ethnobotany and Pharmacological Profile. *Journal of Pharmacognosy and Phyto chemistry*. 1(6): 135-138.

Babu B., Mohana L. S. 2010. Studies on phytochemical and anticonvulsant property of *Martynia annua*. *International joural of Phytopharmacology.* 1(2) :82-86.

Benzie I., Strain J. 1996. The ferric reducing ability of plasma (FRAP) as measure of antioxidant power. *Analytical Biochemistry.* 239-70-76.

Bodding P.O., 1925. Studies in Santhal Medicine and Connected Flok-Lore-I, Santhal and Disease. *Mem. Asiantic Soc. Bengal.* 10(1): 1-132.

Bodding, P.O. 1927. Studies in Santal medicine and connected Folklore II. Santal medicine Ibid 10(2): 133-426

Bondya S.L., Sharma H.P., Kumar J. and Sahu H.B., 2002. Native medical Uses of Plant for *Anthelmensis* (Kirmi) at Ranchi District of Jharkhand. *J. Phytol Res*. 15 (1): 109-110.

Chopra R.N., Nayer S.L. 1996. Glossary of Indian Medicinal Plants, National Institute of Science Communicatio, New Delhi. 162.

D. Khumbongmayum, M. L. Khan & R. S. Tripathi, 2005. An ethnobotanical study of medicinal plants in scared grooves of Manipur, Northeast India, *Indian J. Traditional knowledge,* 4(1): 21-32.

David S. Bredt. 1993. Endogenous nitric oxide synthesis: biological function and pathophysiology. *Free Radic. Res.* 31(6): 577-596.

Ghosh, T.K., Sahu S.C. and Mahato A.K. 1980. Some important Medicinal plants used against dysentery by tribals of Chotanagpur and Santal Pargana (Bihar) 67th Proc. Ind. Sc. Cong. Pp.63 (Abstract)

Gupta, S.P. 1981. Native medicinal uses of plants by the Asures of Netarhat plateau (Bihar) in S.K. Jain (ed) Glimpses of Indian Ethnobotany. New Delhi, 218-219.

Harborne J.B. 1973. Pytochmical Methods: A Guide to modern Techniques of Plant Analysis, London: 1(10): 100-117.

Hembrom, P.P. 1991. Tribal medicine in Chotanagpur and Santal parganas of Bihar, India. *Ethnobotany*. 3: 97-99.

Hembrom, P.P. 1995. Adibasi Aushadh (Horopathy) I-IV (in Hindi) Paharia Seva Samiti, Satia Bihar.

J.P. Yadav, S. Kumar & P. Siwach, 2006; Folk medicine used in gynecological and other related problems by rural population of Haryana, *Indian J. of Traditional Knowledge*, 5(3): 323-326.

Jain, S.K. & Mudgal, V. 1999: A hand Book of Ethnobotany.

Jain, S.K., 1987: A Manual of Ethnobotany Scientific Publishers, Jodhpur.

Kala CP., 2005; Current status of medicinal plants used by traditional Vaidyas in Uttaranchal state of India. *Ethnobot Res Appl*. 3:267-278.

Kenwat P. 2013. *Martynia annua*. *UK Journal of pharmaceutical and Biosciences.* 1(1): 7-10.

Khare C.P. 2007. Encyclopedia of Indian Medicinal Plants. (1956-2007 updated). 44(10): 772-773.

Kirtikar B. 1994. Indian Medicinal Plants, II. in 1730-38. Kokate KC, 4th ed. Delhi: Vallabh Prakashan. *Practical pharmacognosy.* 218.

Kohli, Y. P, 1992; Some prominent medicinal plants of Arunachal Pradesh, Arunachal Forest News, 11(1):35-38.

Kuiri I, Kumar K and Kumar J., 2006. The Edible Ethnomedicobotanical Plants of Purulia District, W.B., *India Int. J. Mendel.* 23:3-4.

Kuiri, Indra Narayan and Kumar Jyoti 2002. Ethnomedicinal plants for the treatment of rheumatism at Baghmundi, Purulia (W.B.) *Ad. Plant Sc.* 15(11): 421-423.

Kumar M. and Kumar J., 2009; Conservation of Traditional knowledge of Hazaribagh Wild Life Santuary, Hazaribagh District, Jharkhand, India. *Biospectra*. 4(2): 445-448.

Manandhar N.P., Manandhar S. 2002. Plants and people of Nepal, Portland: Timber Press, Inc. 311.

Pal, D. C. and Jain S.K. 1998. Tribal Medicine Pp 1-317, Naya Prakash, Calcutta.

R.R. Rao, 1990. Ethno botanical studies on some Adivasi tribes of Nagaland in Northeast India, in contribution to Indian Ethno botany, edited by S K Jain, (Scientific Publisher, Jodhpur India), 215-230.

Ruch R.J., Cheng S.J., Klaunig, J.E. Prevention of cytotoxicity and inhibition of intracellular communication by antioxidant catechins isolated from Chinese green tea.

Sahoo and Mudgal, 1993. Ethnobotany of South Chotanagpur (Bihar).

Sahu H.B, Bondya S.L, Kumar J and Sharma H.P., 2004; Plant used For Gastro- Intestinal Disorder by Ethnic Tribes in Ranchi District. *Geobios*. 31: 149-151.

Singh C.T.N and Kumar J., 2003. *Allmania nodiflora* (L.) R.B.R., A less Known Medicinal Plant of Hazaribagh, Jharkhand. *Ad. Plant. Sci.* 16(2): 403-404.

Singhai L. A. K. 2011. Preliminary pharmacological evaluation of *Martynia annua. Asian Pacific Journal of Tropical Biomedicine.* 1(6): 421-427.

Sofowora A.1993. Medicinal plants and Traditional Medicine in Africa. Spectrum books Ltd., Nigeria. 289.

Topno, 1996. Studies on plants used in traditional herbal medicine system of Khunti Sub-division of Chotanagpur Ph.D. Thesis.

Trease E and Evans W.C. 1989. Pharmacognosy. 13th Edition, London. 345-6 (535-6):772-3.

Verma, S.K. 1999. Ethnobotany of Santal Pargana, Narendra Publishing House: Delhi.

Virginia L.E., Sarah J.S. Rachel T. Joesh E.A. 2003. Mitochondril nitric oxide synthase: Role in pahtophysioology. *IUBMB Life*. 55(10): 599-603.

Y. Kumar, F. Scarlet, & R.R. Rao, 1987. Further contribution to the ethno botany of Meghalaya, plants used by the people of Jayantia Hills, Districts, *J. Econ Tax Bot.* 99(11):65-70.

Young I.S. 2001. Woodside Antioxidant in health and diseases. *Clinical Pathology.* 54:176-186.